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## **Psychotherapy as entropy management**

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## Summary

We present the hypothesis that the laws of thermodynamics can be usefully applied to psychotherapy. In this model psychotherapy is presented as a means of *entropy* management, whereby the patient trades *entropy* (in this case the expressed symptoms of mental disorder) with the therapist. The therapist serves to increase the *capacity* of the patient, both through developing a shared understanding of the challenges the patient faces and through generating shared solutions. This process can be understood in terms of *entropy trade* where *energy* is successfully redirected into adaptive behaviour. The hypothesis and proposed model of psychotherapy are evaluated in the context of current thinking about the components of successful psychotherapeutic outcomes; including evidence based practice, therapist competence and adherence and the therapeutic alliance.

## Introduction

Universal laws by definition should have universal applications, including to human behaviour. This article hypothesises that the universal principles enshrined in the laws of thermodynamics can provide a model of psychotherapy as a process of entropy management.

### *Life, the universe and energy transfer*

Humans, as with all living organisms, exist by the transfer of energy and are, therefore subject to the universal law of thermodynamics. In brief these state that there is only a finite amount of energy in the universe; this can't be increased or destroyed, but can only be transferred from one form to another. This energy transfer is never completely efficient and this inefficiency i.e. unavailability for constructive work, is conceptualised as *entropy*.<sup>1</sup>

Closed systems move to 100% *entropy*. Life forms, as open systems, have the capacity to redirect *entropy* into *energy* that can be put to constructive use.<sup>2</sup> Our hypothesis is that effective therapy, through the additional *capacity* the therapist brings, acts to facilitate this redirection process

### *People as open systems*

Human biological systems constantly regulate and adjust in order to achieve a homeostatic state in the face of changing internal and external demands and conditions.<sup>3</sup> The human body is an open system, which, according to the laws of thermodynamics, must trade entropy with the environment in order to maintain homeostatic function i.e. health. Human behaviour, in its multiple complex adaptive and maladaptive forms, can be viewed as a means of trading *entropy*; while human distress can be conceptualised as resulting from unsuccessful attempts to trade entropy.

Health, therefore, can be viewed as the homeostatic state attained when the energy that is transferred to achieve this state i.e. that is required to meet the changing demands, is within the optimal functional capacity of the body. Ill health, whether psychological or physical, in this model is seen as resulting from functioning that occurs out with the homeostatic range.

Murray & McKenzie<sup>4</sup> attempted to capture this model in a simple equation:

$$\text{Health} = \frac{\text{Energy} - \text{Entropy} \times \text{Capacity}}{\text{Work}}$$

Here, *energy* is that which is required to meet the current environmental demands, whether internal or external to the person i.e. *work*. *Capacity* represents the resources available to the person in order to optimally meet the current demands, and may comprise of many interacting factors including intellectual ability, personality, adaptive skills, and supportive relationships with others. Finally, *entropy* is the energy that is not available to do the *work* because it is being directed into non-adaptive activity, resulting in disordered behaviour and ill health.

Thus ill health is the consequence of interactions at various points of the inter-related system of *capacity*, *work* and *energy* transfer. It was argued<sup>4</sup> that this model could helpfully be applied to mental disorders as it lends itself to a dynamic, systemic functional behaviour analysis approach, offering a range of points within the system at which assessment and intervention can take place. This model is broadly compatible with emerging conceptualisations of mental disorders as complex, dynamic networks.<sup>5,6</sup> in contrast with traditional diagnostic, categorical approaches to such difficulties.

### *The hypothesis: psychotherapy as entropy management*

Here we extend this thinking and present the hypothesis that psychotherapy is subject to the same universal laws as other systems that involve *energy* transfer, and can be usefully conceptualised as a means of *entropy* management, whereby the patient trades *entropy* (the expressed symptoms of mental disorder) with the therapist. We hypothesise that psychotherapy can be viewed as providing additional *capacity* for the individual to draw on in order to meet the *work* demands, by facilitating the managed trade of entropy. In short, psychotherapy can be conceptualised as a means of managed *entropy* trade. We will evaluate whether this hypothesis is compatible with the existing evidence base in respect of psychotherapeutic approaches.

### *Evaluating the hypothesis*

Psychotherapy can be defined as ‘predominantly talk-based psychological therapies in their various forms’<sup>7</sup>(p7). Research indicates that four main components are important in obtaining a successful outcome for the individual in psychotherapy: the use of evidence based practice, therapist competence, therapeutic fidelity and the therapeutic alliance.

### *Evidence based practice*

Psychotherapists can draw on a range of evidence based guidance about the most appropriate intervention to meet the patient’s needs..<sup>7,8</sup>. Notwithstanding the criticisms of the guideline development process itself as one that is often influenced by vested interests, personal views or ethnocentric stances, (see Grol<sup>9</sup>) such guidance tends to be premised on an ideal patient who has no co-morbid conditions<sup>9</sup> and is underpinned by a paradigm within which mental health problems are understood as discrete diagnostic categories, This is despite increasing recognition of the limitations of this conceptualisation.<sup>5,6</sup> The hypothesised model of

psychotherapy, by contrast, recognises mental health difficulties as resulting from multiple potential interaction points between the components of *work*, *energy transfer*, and *capacity*, all occurring within a complex and dynamic system.

### *Therapist competence and adherence*

Underpinning evidence based guidance is the assumption that, in order to be effective, the therapist delivering the intervention must be competent and adhere to any protocol. Brown et al.<sup>10</sup> describe competence as ‘the skill of a clinician in delivering a particular therapeutic intervention and to act as an “agent of psychological change” (p 98) and adherence as ‘the degree to which therapists follow a prescribed manual without deviation (p98).

The literature in relation to competence and adherence, is, however, not straightforward, with some studies showing a positive relationship between competence and outcome, while others do not. Similar contradictory results have been found for the relationship between adherence and outcomes (see Brown et al.<sup>10</sup> for an overview), suggesting the need for additional explanatory factors. Davidson & Scott<sup>11</sup> note that the ability to develop a strong therapeutic alliance (TA) is a prerequisite step to successfully implementing any technical intervention and this factor is explored in relation to the proposed hypothesis below.

### *Therapeutic alliance*

Therapeutic alliance (TA) is a component of psychotherapy which is a parallel to, but independent of the specific treatment protocol and techniques.<sup>12,13</sup> There are a variety of conceptualisations of TA, the majority of which contain some reference to the idea of ‘purposive mutual work.’<sup>14</sup> A recent review<sup>14</sup> concludes that the ‘most persuasive’ is derived from the work of Hougaard<sup>15</sup> which sees TA as comprising two components:

‘personal alliance’ which relates to the interpersonal relationship and ‘task related alliance’ which refers to the goal or *work* focused elements of the intervention. Elvins & Green<sup>14</sup> note that, while TA has been shown to be an important factor in the outcome of mental health interventions, to date, no unifying model of TA has been developed that can encompass the range of conceptually different, yet inter-related TA constructs and measures.<sup>15</sup>

The present hypothesis would propose that TA can be understood as any component of therapy that increases the *capacity* of the patient, both through developing a shared understanding of the challenges the patient faced (cf personal alliance component of TA) and through generating shared solutions i.e. to do the *work* (cf task related alliance). This process can be understood in terms of *entropy trade* as *energy* is successfully redirected into adaptive behaviour that meets the *work* demands.

As with TA models, these components would be seen as underpinning, but not tied to any one psychotherapeutic approach or intervention.<sup>16</sup> The differences in TA components measured across studies, may simply reflect a dynamic process whereby the therapist and patient respond ‘in the moment’ to the changing interaction between *capacity*, demands (*work*) and *energy* available and the therapist’s ability to formulate and reformulate the patient’s difficulties and respond to this in a range of ways to reduce demands and increase *capacity*. This dynamic process may also explain the findings that successful therapeutic outcomes are better predicted by the patterns of successfully constructing, rupturing and repairing the TA than by a steady, linear development in the alliance over time or as a direct function of time<sup>17</sup>. The therapist may at times, misjudge the *capacity* of, demands on (*work*) or *energy* available to the patient and may, therefore, fail to provide the optimal environment for *entropy trade*.



The ability of the therapist and patient to repair this set back and move forward appears to be key for therapeutic process to occur.

### *Conclusion and implications*

The paper hypothesises that the conceptualisation of psychotherapy as a means of managed *energy* transfer offers a model that is helpful in understanding the research in relation to therapist competence, adherence and ability to build a TA. We propose that this is achieved by the therapist providing additional *capacity* through the therapeutic relationship to allow the patient to successfully trade *entropy*, thus redirecting *energy* into adaptive behaviour. The model, while requiring further development and evaluation, advocates the need to conceptualise mental disorders as dynamic concepts that similarly require dynamic and systemic formulation in a context that results in productive *entropy trade*. If valid, the model will have implications for the training of health professionals and health interventions more widely.

### **Author contribution**

Both KM and GCM were involved in the conceptualisation of the hypothesis and writing and editing the paper.

### **Conflicts of interest**

None

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